

Bureau of Water

South Carolina Department of Health and Environmental

An Assessment Of Groundwater Conditions In Hampton County For Capacity Use Designation



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An Assessment Of Groundwater Conditions In Hampton County For Capacity Use Designation

**South Carolina Department of Health and
Environmental Control
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**Bureau of Water
Water Monitoring, Assessment, and Protection Division
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Introduction

The South Carolina Department of Health and Environmental Control (DHEC) has been requested to designate Hampton County as part of the Low Country Capacity Use Area, currently consisting of Beaufort, Colleton, and Jasper counties. The request was initiated by the Hampton County Council during the September 18, 2006 council meeting and presented to DHEC by letter dated September 21, 2006. **Figure 1** shows Hampton County in relation to the existing Low Country Capacity Use Area and **Figure 2** shows the Low Country Capacity Use Area in relation to the Trident, Waccamaw, and Pee Dee Capacity Use Areas. Designation as a Capacity Use Area requires groundwater withdrawers within a Capacity Use Area to obtain a permit to operate from DHEC. A groundwater withdrawer is defined as “a person withdrawing groundwater in excess of three million gallons during any one month from a single well or from *multiple* wells under common ownership within a one-mile radius from any one existing or proposed well.” The permitting process is intended to allow DHEC to coordinate and work with users of the groundwater resource to effectively manage withdrawals to control and minimize adverse effects on the local aquifers. Withdrawals are permitted based on reasonable use requirements and demonstrated need(s) of a particular activity or industry. Mandatory reporting of groundwater use ensures permit compliance and allows DHEC, local government agencies and all interested stakeholders to determine historical use trends and establish criteria for future planning decisions.

South Carolina's Groundwater Use and Reporting Regulation R.61-113 (promulgated under Title 49 Chapter 5, Groundwater Use and Reporting Act) provides the legal authority and mandate for DHEC to establish and implement an effective statewide groundwater management program. Where groundwater withdrawals present potential adverse effects to the natural resource or pose a threat to public health, safety or economic welfare, or where conditions pose a significant threat to the long-term viability of a groundwater source, a Capacity Use Area may be designated by the DHEC Board after notice and public hearing in accordance with the Administrative Procedures Act. The notice and public hearing must be conducted such that local government authorities, groundwater withdrawers, or the general public may provide comments concerning the Capacity Use designation process. A Capacity Use Area must be designated based on scientific studies and evaluation of groundwater resources and usage and may or may not conform to political boundaries.

*Hampton County in Relation
to Low Country Capacity Use Area*

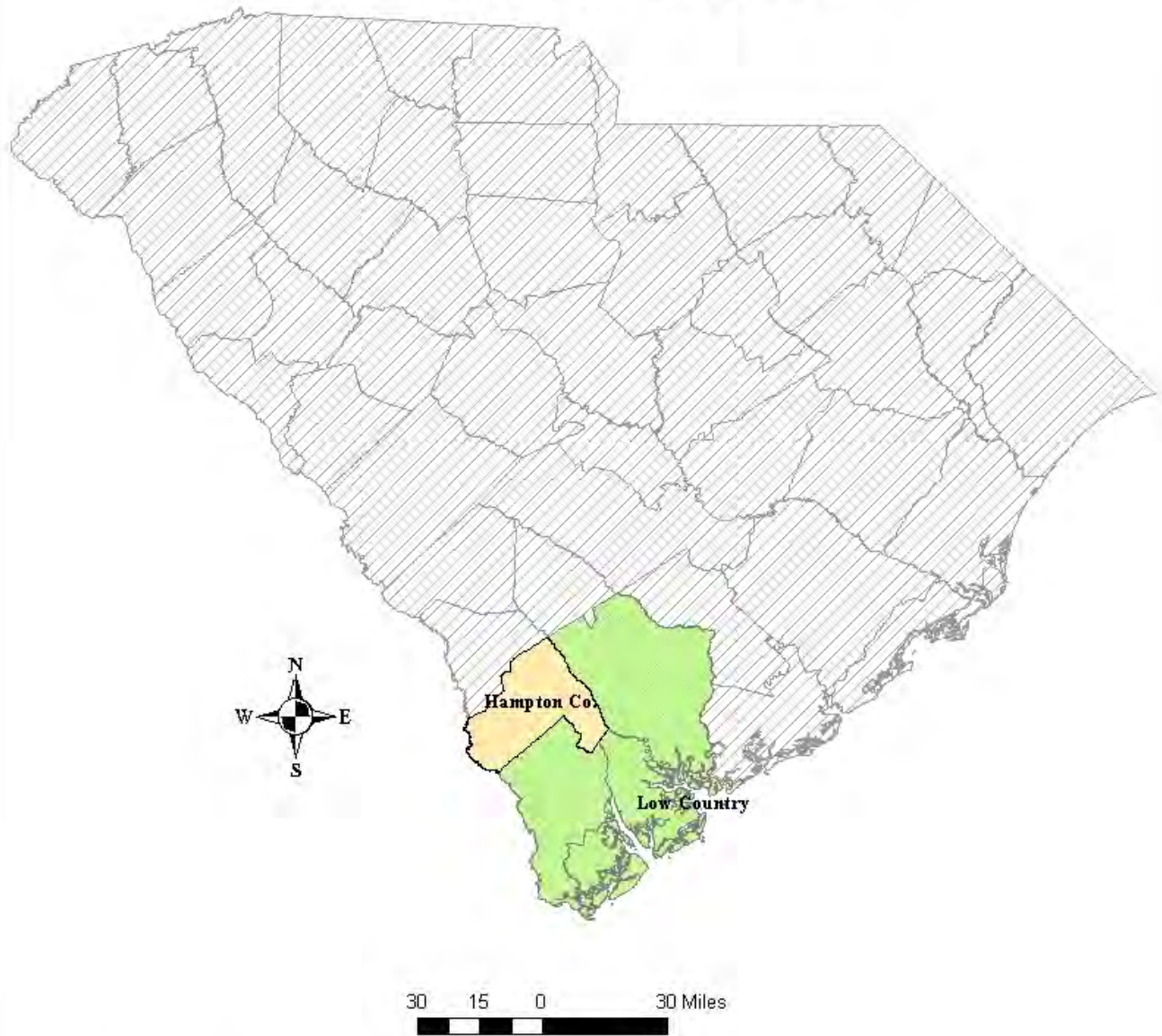


Figure 1

*Hampton County in Relation
to Designated Capacity Use Area's*

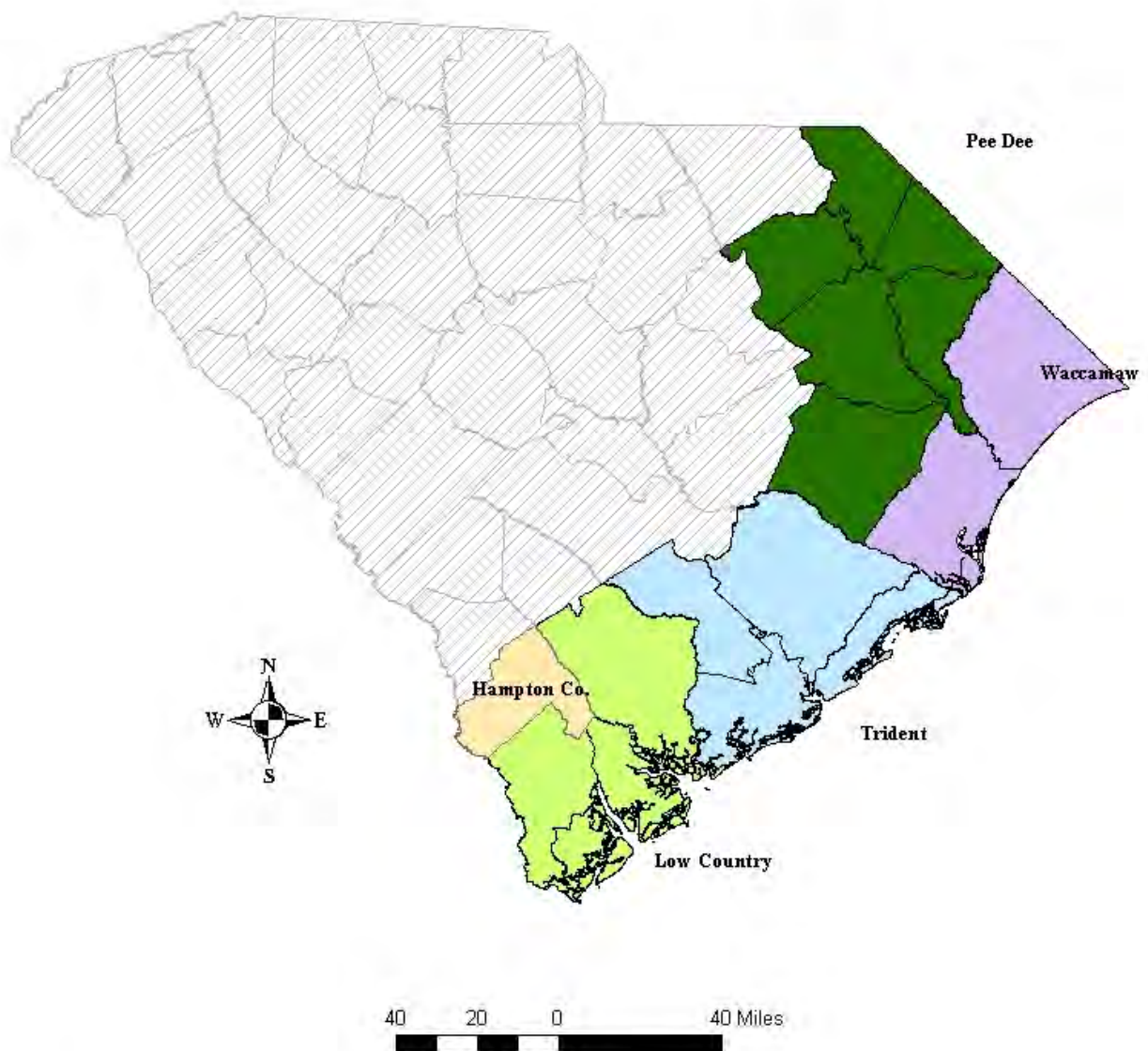


Figure 2

Background

During the summer of 1990 approximately forty-five (45) private wells in the vicinity of the towns of Estill and Furman in Hampton County reportedly were impacted by regional and local water level declines in the Upper Floridan Aquifer. These reported well problems in 1990 are similar to problems reported recently, including reduction of yields and/or water pressure, dry wells, and pump burn-out as water levels decline below pump settings. The former South Carolina Water Resources Commission (SCWRC) SCWRC investigated these complaints and in SCWRC Open-File report No. 37, *Preliminary Investigation of Water-level Declines in Wells Near Estill, Hampton County, South Carolina* (1990), Whiting and Park demonstrated that “large capacity” wells at one site were a major contributor to well interference, although other users may have contributed to the declines.

A subsequent SCWRC investigation culminated with SCWRC Open-File Report No. 40, *Report of a Capacity-Use Investigation for Hampton County, South Carolina* (1990). This report documented progressive water level declines and increasing demands on the water resources of the county and recommended Hampton County for inclusion with the Low Country Capacity Use Area.

With a growing industrial base and increasing reliance on groundwater for agricultural interests, Hampton County Council recognizes the potential for multiple, conflicting use of the groundwater resources in the county and is seeking inclusion in the Low Country Capacity Use Area.

Setting

Hampton County is situated in the southwest corner of South Carolina and is bounded by Allendale County to the north, Colleton County to the east, Jasper County to the south, and the Savannah River to the west. Encompassing approximately 560 square miles of land area (approximately 358,355 acres), Hampton County is located in the Coastal Plain physiographic province of South Carolina, **Figure 3**, and exhibits topographic relief typical for the lower coastal plain; low relief and gentle slopes with elevation ranging from 20 feet above sea level to 150 feet above sea level. Surface water drainage occurs through the Savannah, Coosawhatchie, and Salkehatchie-Combahee Rivers and many other numerous streams, creeks, and wetlands. The South Carolina Forestry Commission estimates that nearly 71% of the land area remains as forested. The remaining land area is farmland or urban development.

According to available census data, Hampton County’s population for 1980 was 18,159 and 21,386 in 2000, representing an average annual growth rate of nearly 1%. The current population is predominantly rural at 64.2% (13,738) with 35.8% (7,648) residing in developed areas. Major communities (populations greater than 100) include Hampton (population 2,837), Estill (population 2,425), Varnville (population 2,074), Yemassee (population 807), and Brunson (population 589). Smaller communities include Gifford (population 370), Furman (population 286), Scotia (population 227), and Luray (population 115), **Figure 4**. Thirty-two companies have located or expanded in the county, bringing \$53 million in new investment and creating 475 additional jobs. For the period 1980-2000 the average annual growth rate for jobs was 0.80%. Major industries include Nevamar (500 employees), Elliot Sawmilling Company (200 employees), Carsonite International (132 employees), and Le Creuset of America (104 employees). Numerous other industries in the county employ less than

50 persons each. The county has two (2) industrial parks, the 470 acre Lowcountry Regional Industrial Park in Early Branch and the 300-acre Estill Industrial Park in Estill.

Climate

Hampton County's climate is greatly influenced by its location in the northern mid-latitudes and proximity to the Atlantic Ocean. The mid-latitude location allows for varying intensities of solar radiation during the year, resulting in four (4) distinct seasons; summer, fall, winter, and spring. The Southeast Regional Climate Center (Columbia, S.C.) has weather recording stations located in the Town of Hampton (383906) and the Town of Yemassee (389469). For the period of record 1951-2004, the average air temperature for Hampton was 65.5° F and Yemassee was 65° F. During the same period, the average annual precipitation for Hampton was 47.71 inches and Yemassee was 50.5 inches. For both stations June, July, and August were the wettest months and October, November, and December were the driest months. The annual average temperatures for Hampton County are; Maximum-77.5° F, Minimum-53.5° F, and Mean-°65.5 F. The annual average rainfall for Hampton County is 48.34”.

Physiographic Provinces of South Carolina

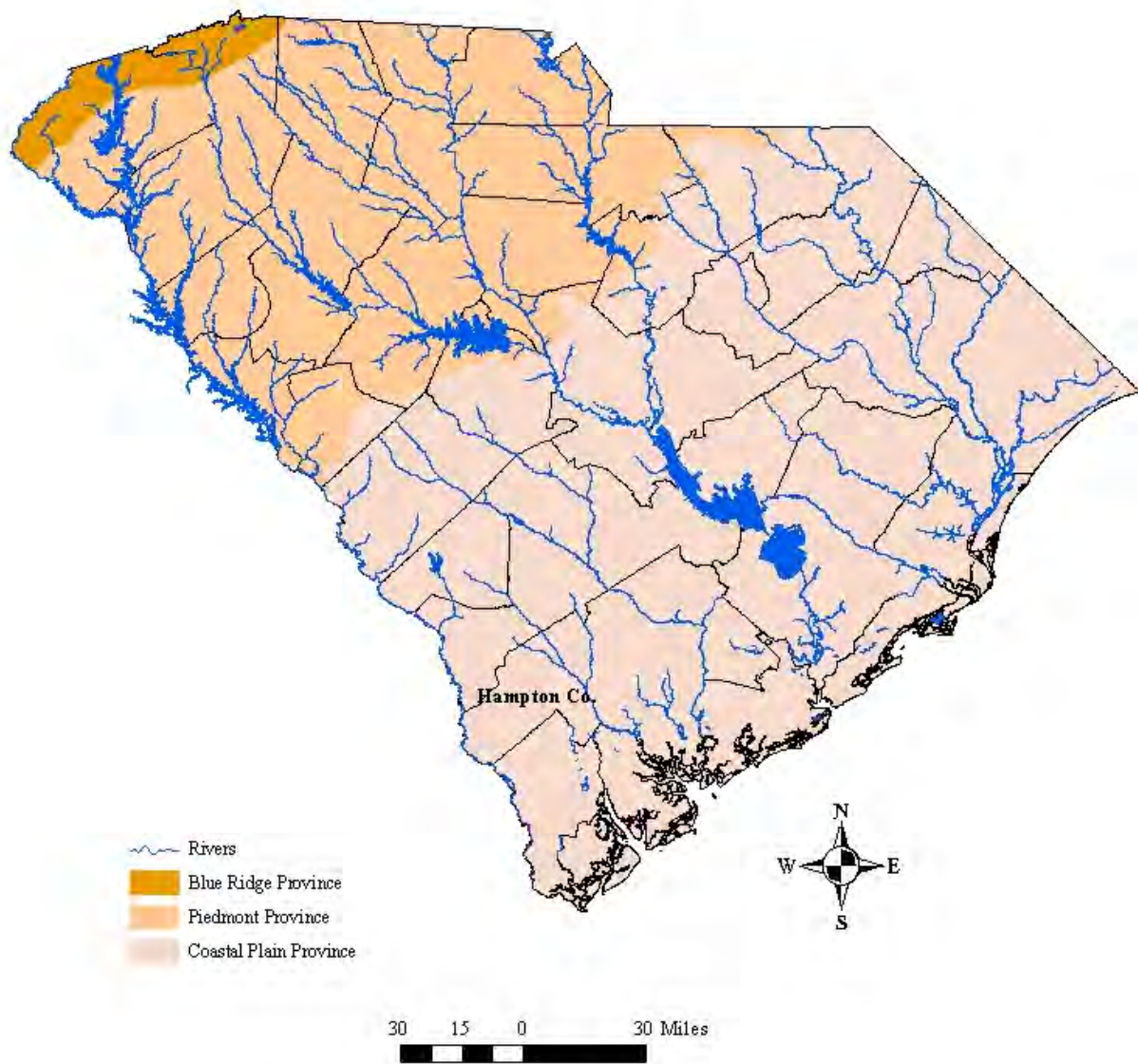


Figure 3

*Hampton County Communities
(population greater than 100)*

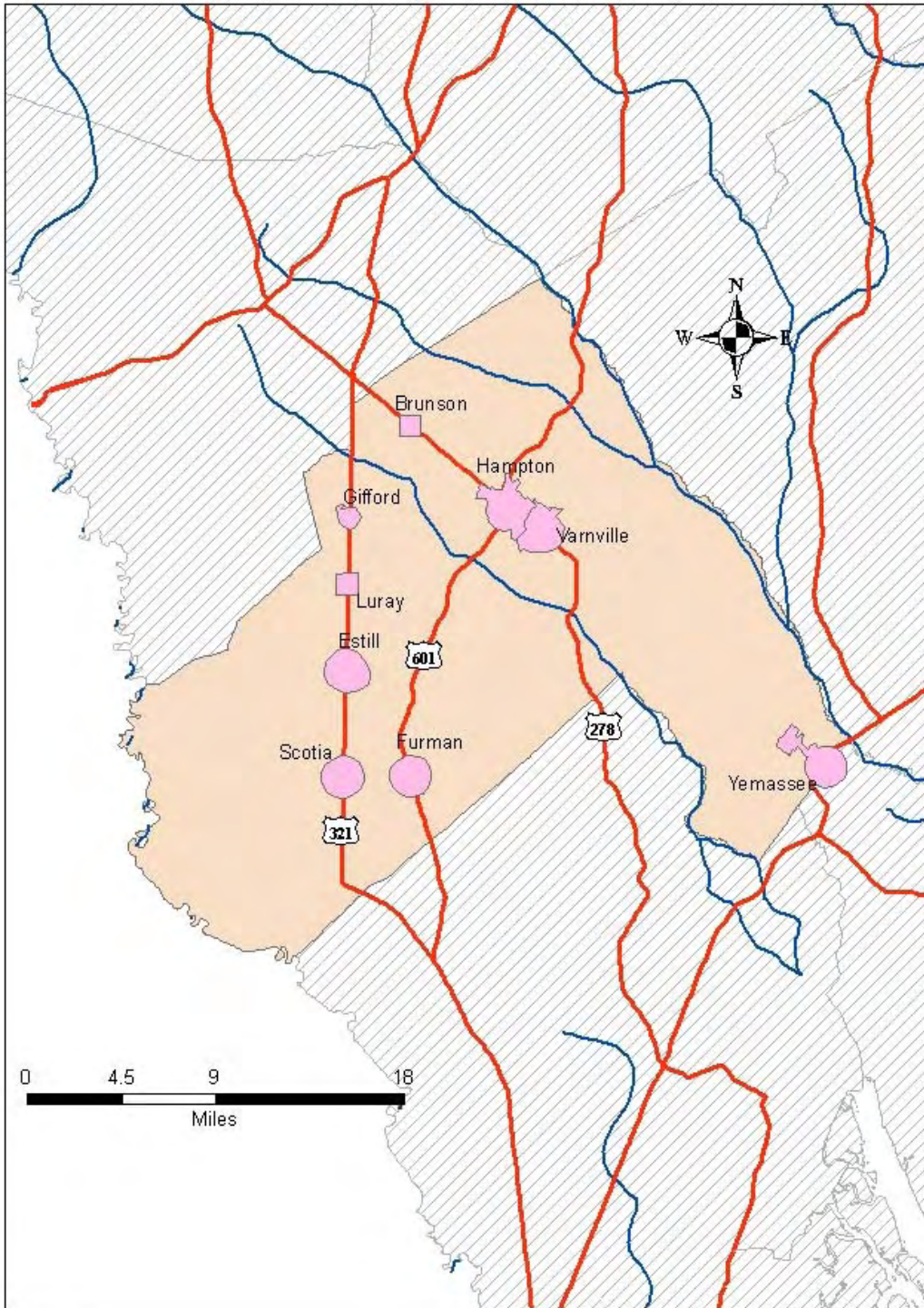


Figure 4

Hydrogeology

The Coastal Plain of South Carolina is a wedge of unconsolidated to poorly consolidated sediments that originated from terrestrial, marginal marine, and marine environments that thickens from a few feet at the Fall Line to nearly 3,800 feet below ground surface near Hilton Head Island. These sediments consist of sands, clays, clayey sands, shells and shell fragments, and carbonates of Lower Cretaceous and younger ages deposited on Paleozoic age basement rock. The geologic strata of the Coastal Plain is typically grouped into aquifers or confining units based on relative permeability and areal extent and continuity of the sediments. Groundwater generally moves laterally within aquifers while confining units inhibit but do not prevent movement of water between aquifers.

Hampton County is underlain by approximately 2,400 feet of sediments, with freshwater aquifers existing from near land surface to a depth of approximately 2,000 feet below ground surface. The basal aquifer (oldest) is the Lower Cretaceous Cape Fear aquifer that occurs from a depth of 2000 feet to 2400 feet. The extent of this aquifer is poorly understood with limited water quality data indicating the aquifer is highly mineralized and brackish. Sediments of the Middendorf aquifer (Middle Cretaceous) and Black Creek aquifer (Upper Cretaceous) occur from a depth of 900 feet to 2000 feet. Sediments of the Middendorf are typically fine- to coarse-grained (calcareous) sand with thin to thick beds of green, purple, and maroon clay. Sediments of the Black Creek are typically gray and white calcareous sand with dark thinly laminated clays. The Paleocene age Black Mingo aquifer occurs from 500 feet to 900 feet and is comprised typically of black sandy limestone with clay, light gray sands, and some shell fragments. The upper 500 feet of sediments include the Eocene age Santee Limestone and Ocala Limestone, which comprise the Floridan aquifer and is the primary source of drinking water for Hampton County.

Water Use

Hampton County groundwater withdrawals are reported by facilities withdrawing groundwater in excess of three million gallons during any one month from a single well or from *multiple* wells under common ownership within a one-mile radius from any one existing or proposed well, in accordance with R.61-113. For 2005, thirty (30) facilities with sixty-six (66) active wells, **Figure 5**, reported withdrawal of 2,425,814,000 gallons of water, compared to 2004 (26 facilities, 60 wells) at 1,946,981,000 gallons, and 2003 (22 facilities, 56 wells) at 1,839,708,000 gallons. A further 190,001,000 gallons of water (2005) are estimated as “self-supplied” for areas not on public water systems (DHEC Water Supply System inventories were reviewed to estimate the population on public supply [10,918], for a rural population of 10,411 utilizing 50 gallons per day per person). Calculating the self-supply total, the estimated total groundwater withdrawal for Hampton County in 2005 is 2,615,815,000 gallons or approximately 7.2 million gallons per day. **Table 1** presents reported groundwater use by facility and source and **Table 2** presents reported groundwater use by category for the years 2003, 2004, and 2005.

Table 1: Reported Groundwater Use by Facility/Source

Note: All data in million gallons

Facility Name	Facility Source	2005	2004	2003
Fish Network Inc.	25AQ033G01	122.28	128.30	85.30
Penny Branch GC	25GC012G01	34.75	30.05	14.08
GC at Hampton Yard	25GC050G01	0.00	0.02	0.39

Nevamar Industries	25IN001G02	426.90	314.20	294.80
	25IN001G03	47.00	49.50	47.50
	25IN001G04	14.60	29.50	34.10
L&B Youmans Farm	25IR003G01	24.00	20.00	14.00
	25IR003G02	26.00	32.00	16.00
Youmans Farm	25IR009G01	104.00	90.00	60.00
	25IR009G02	80.00	74.00	47.00
	25IR009G03	22.50	21.00	14.00
	25IR009G04	22.00	23.50	16.00
	25IR009G05	0.00	21.00	19.00
	25IR009G06	21.00	21.00	10.00
	25IR009G07	14.00	15.00	9.00
Platts Farm	25IR010G01	0.00	0.00	0.00
	25IR010G02	0.00	15.55	0.00
	25IR010G03	0.00	0.02	0.00
E. Rouse Farm	25IR015G01	122.20	97.90	19.28
	25IR015G02	60.90	34.40	6.50
	25IR015G03	73.80	42.20	7.80
	25IR015G04	26.20	18.40	3.60
Youmans Farm	25IR020G01	8.00	11.00	10.00
	25IR020G02	23.50	17.00	6.00
	25IR020G03	33.00	27.00	16.00
	25IR020G04	20.00	15.00	
Youmans Farm	25IR022G01	18.00	18.00	14.00
	25IR022G02	0.00	28.00	26.00
Nimmer Turf	25IR025G01	61.06	52.00	8.71
	25IR025G02	50.30	0.00	0.00
Crapse Farm	25IR027G01	23.40	15.00	12.00
Ginn Farm	25IR028G01	9.79	21.53	468.00
Kuzzens Inc.	25IR029G01	0.00	0.00	7.79
	25IR029G02	25.52	16.37	0.00
Kuzzens Inc.	25IR030G01	24.59	22.28	13.98
	25IR030G02	26.34	9.12	14.04
Nimmer Turf	25IR031G01	33.29	39.60	
	25IR031G02	0.00	3.30	
Nimmer Turf	25IR032G01	18.17		
Mixon Farm	25IR033G01	45.05	31.00	
TBR Way farm	25IR034G01	14.42		
J. Jarrell Farm	25IR051G01	3.86	1.94	0.00
	25IR051G02	3.76	4.49	0.48
D. Jarrell Farm	25IR052G01	0.00	3.50	3.00
Nimmer Turf	25IR053G01	80.26	13.90	14.04
Youmans Farm	25IR054G01	15.00		
	25IR054G02	16.00		
	25IR054G03	46.00		
Nimmer Turf	25IR055G01	50.11		
Town of Hampton	25WS001G02	65.66	34.89	54.97

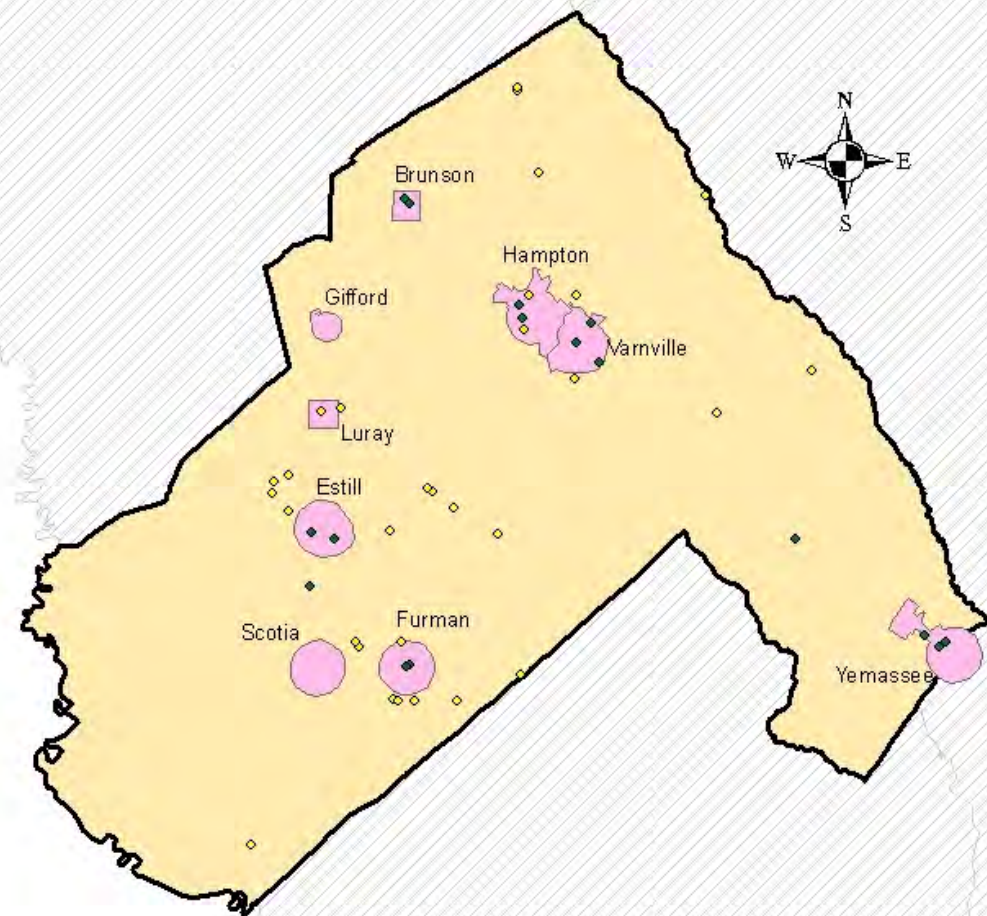
Town of Hampton	25WS001G04	72.39	94.66	68.33
Town of Varnville	25WS002G02	0.00	0.00	0.00
	25WS002G03	18.38	0.08	7.33
	25WS002G04	83.70	71.94	72.60
Town of Estill	25WS003G03	41.43	51.27	57.71
	25WS003G07	96.15	107.58	99.65
	25WS003G08	47.10	45.01	39.01
Town of Yemassee	25WS004G01	0.00	0.00	0.00
	25WS004G02	64.65	33.20	49.00
	25WS004G03	1.21	39.09	16.92
	25WS004G04	1.95	0.77	1.97
	25WS004G05	0.32	1.14	0.46
Town of Brunson	25WS005G01	24.89	21.93	26.90
	25WS005G02	0.55	0.93	0.35
Town of Furman	25WS006G01	11.89	9.25	8.33
	25WS006G02	3.97	7.68	3.80
		2,425.81	1,946.98	1,839.71

Table 2: Reported Groundwater Withdrawal by Category of Use

Note: All data in million gallons

Report Category	2005	2004	2003
Aquaculture	122.28	128.30	85.30
Golf Course	34.75	30.07	14.47
Industry	488.50	393.20	376.40
Irrigation	1,246.03	876.00	856.22
Water Supply	534.26	519.41	507.32
	2,425.81	1,946.98	1,839.71

*Hampton County Reported Groundwater
Withdrawal (> 3 million gallons/month)*



- ◆ Public Supply Wells (reporting)
- ◆ Groundwater Wells (reporting)

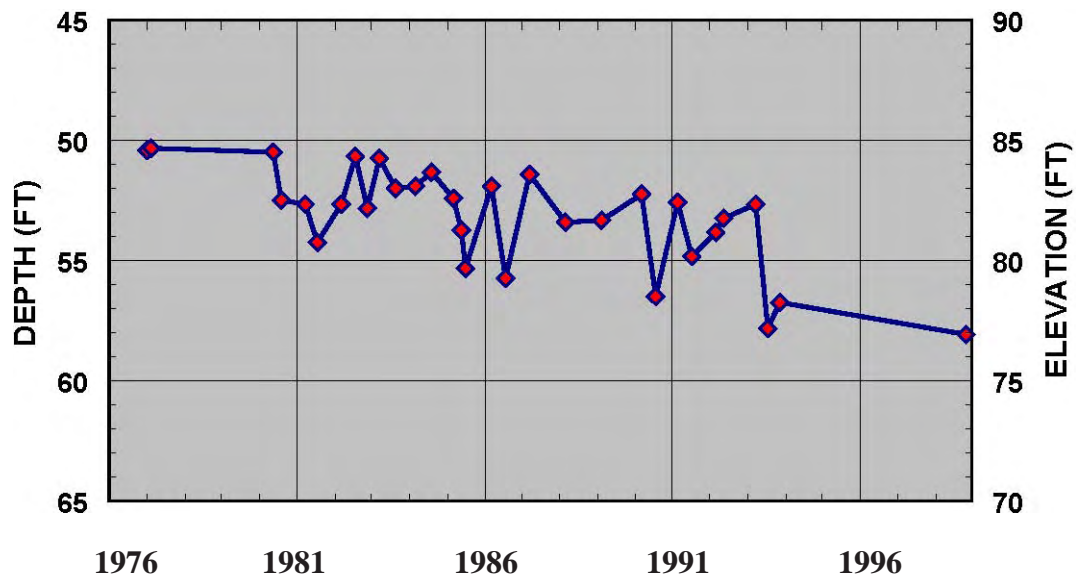
0 3.5 7 14
Miles

Figure 5

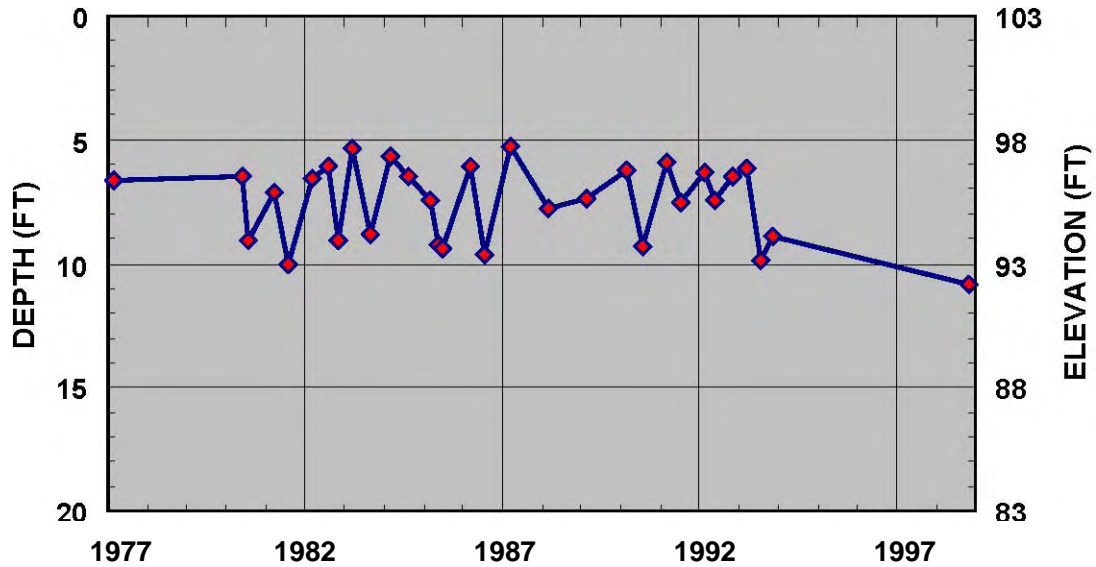
Water Level Declines

Although Hampton County has available an excellent supply of groundwater, the resources is neither limitless nor immune to potential impacts by overuse or improper management. The several previous investigations conducted by the former Water Resources Commission and the Department of Natural Resources (DNR) have clearly demonstrated that water levels are continuing to decline throughout the county. According to work by Aucott and Speiran (1985), pre-development water levels in the primary aquifer used in Hampton County, the Floridan aquifer, were higher than 100 feet mean sea level (MSL), but data acquired in 1998 indicated water level declines to 80 feet MSL in the Floridan aquifer. **Figure 6** depicts the potentiometric surface of the Upper Floridan Aquifer as measured and mapped by DNR (Hockensmith 2001). Monitor well HAM-74 had a measured decline of 8 feet from 1976 to 1998; monitor well HAM-80 had a measured decline of 5 feet from 1990 and 1998; monitor well HAM-105 had a measured decline of 8 feet from 1988 to 1998. Continued growth and demand on the groundwater resource will exacerbate the water level declines and instances of well interference, with expanding and overlapping cones of depression from nearby wells, will become more numerous and widespread through time.

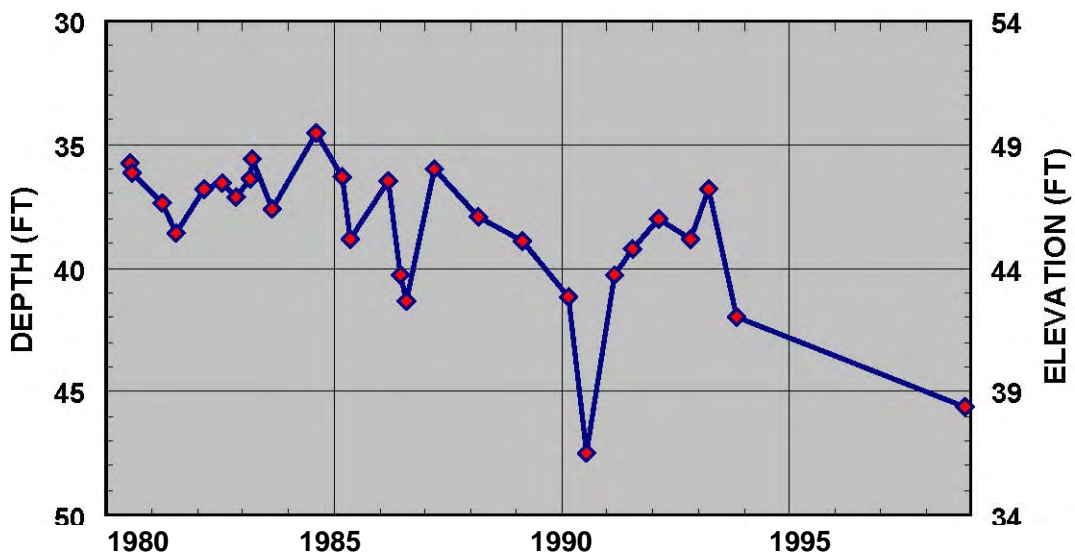
WELL NUMBER: HAM-74
LATITUDE: 32°52'42" **LONGITUDE:** 81°02'24"
LOCATION: 3 mi northeast of Varnville on S.C. 63 and 170 ft NE of the intersection of S.C. 63 and 363.
AQUIFER: Floridan.
CHARACTERISTICS: 4-inch diameter observation well.
Depth: 200 ft. **Open interval:** 110-200 ft.
DATUM: Land surface datum is 135 ft above National Geodetic Vertical Datum of 1929.



WELL NUMBER: HAM-80
LATITUDE: 32°53'52" **LONGITUDE:** 81°14'18"
LOCATION: 2 mi N of Gifford at the intersection of U.S. 321 and County Roads 21 and 12.
AQUIFER: Floridan.
CHARACTERISTICS: 4-inch diameter observation well.
Depth: 60 ft. **Open interval:** 24-60 ft
DATUM: Land surface datum is 103 ft above National Geodetic Vertical Datum of 1929.



WELL NUMBER: HAM-105
LATITUDE: 32°43'20" **LONGITUDE:** 81°06'27"
LOCATION: 10 mi south of Hampton on S.C. 3 and 0.6 mi northwest of County Road 345.
AQUIFER: Floridan.
CHARACTERISTICS: 4-inch diameter domestic well.
Depth: 270 ft. **Open interval:** 250-270 ft.
DATUM: Land surface datum is 84 ft above National Geodetic Vertical Datum of 1929.



***Potentiometric Surface of the
Floridan Aquifer in Hampton County, SC, 1998***

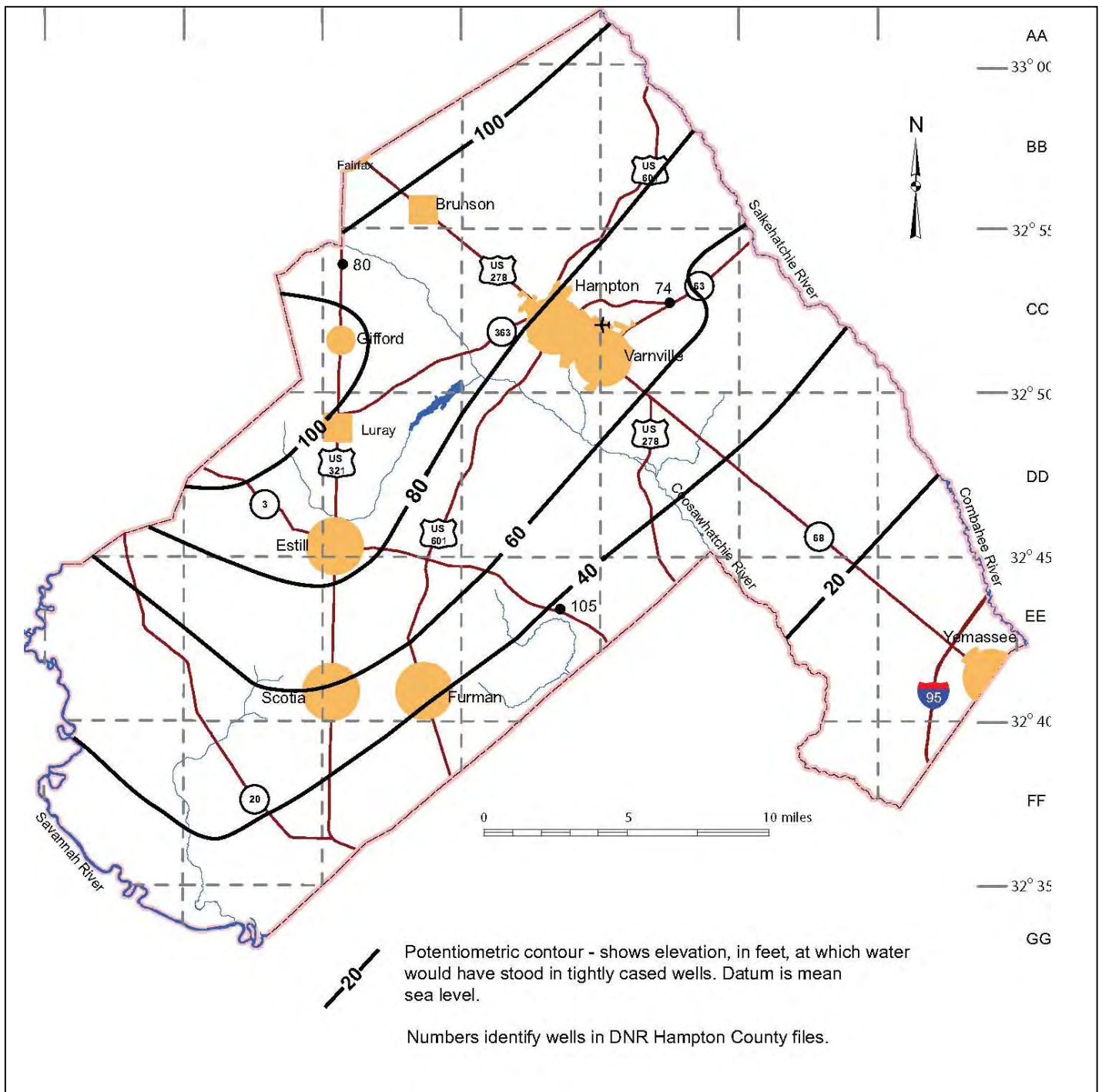


Figure 6 Potentiometric surface of the Floridan aquifer, 1998 (from Newcome and Gellici, 2006; after Hockensmith, 2001).

Conclusions and Recommendations

Based on the technical data available, which have been summarized in this report, DHEC staff conclude that Hampton County has developed and utilized groundwater to the degree that coordination and regulation of groundwater supplies has become desirable and necessary. Reported groundwater withdrawals in Hampton County have steadily increased and groundwater level declines in wells across the county have been observed. As demand on the groundwater resource continues to grow, water level declines will adversely impact groundwater users and become more frequent and serious over time. Therefore, staff recommends inclusion of Hampton County into the existing Low Country Capacity Use Area. This action is desirable in that the counties of Beaufort, Colleton, Hampton, and Jasper all share the same groundwater resources and these same resources all show signs of stress in each county. Regional regulation of groundwater withdrawals also is desired to address saltwater intrusion into the Floridan aquifer in coastal Beaufort County. Further, inclusion of Hampton County with the Low Country Capacity Use Area would be consistent with the designations of the Low Country, Waccamaw, Trident, and Pee Dee Capacity Use Areas whereby the aquifers underlying the coastal counties of South Carolina will be under reasonable and consistent regulatory oversight. Placing the coastal counties under a single regulation provides greater measures to prevent, mitigate, and abate unreasonable adverse effects on the groundwater resource and those entities relying on that resource.

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